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# EXHAUST EMISSION CONTROL DEVICE FOR INTERNAL COMBUSTION ENGINE
[Nainen kikan no haiki jouka souchi]

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[Claims] /*

[Claim 1] An exhaust emission control device of the invention for an internal combustion engine is characterized by being equipped with:

a turbocharger which is installed in the exhaust passage and which pressurizes the intake air by using the exhaust gas pressure;

an inlet-side exhaust gas pressure detecting means that detects the exhaust gas pressure at the upstream side of the exhaust gas passage of this turbocharger;

an outlet-side airflow amount detecting means that detects the amount of the airflow pressurized and taken in by the turbocharger;

a filter that is installed in the exhaust passage, supports an oxidation catalyst, and can capture the fine particles contained in the exhaust gas;

a bypass passage that branches off from the exhaust passage so that the exhaust gas will bypass the filter and turbocharger;

a bypass valve that opens and closes this bypass passage; and

a control means that controls the opening and closing of the bypass valve based on the value of the exhaust gas pressure detected by the inlet-side exhaust gas pressure detecting means and the amount of airflow detected by the outlet-side airflow amount detecting means.

[Claim 2] An exhaust emission control device defined in Claim 1

* Claim and paragraph numbers correspond to those in the foreign text.

for an internal combustion engine, wherein the control means controls the opening/closing of the bypass valve by evaluating the filter with respect to clogging based on the pressure value from the inlet-side exhaust gas pressure detecting means and the airflow amount from the outlet-side airflow amount detecting means.

[Claim 3] An exhaust emission control device defined in Claim 2 for an internal combustion engine, wherein the abovementioned control means causes the bypassing of the exhaust gas to occur by opening the bypass valve and also generates an alarm if it judged that a clogging error of the abovementioned filter has occurred based on the abovementioned detected value of the exhaust gas pressure and the airflow amount.

[Claim 4] An exhaust emission control device defined in any one of Claim 1 through Claim 3 for an internal combustion engine, wherein the bypass valve is a waste gate valve.

[Detailed Description of the Invention]

[0001] [Technical Field of the Invention]

The present invention relates to an exhaust emission control device for an internal combustion engine, specifically to an exhaust emission control device for an internal combustion engine in which a filter is disposed inside the engine exhaust passage in order to remove the fine particles, such as soot, contained in the exhaust gas.

[0002] [Related Art of the Invention]

A conventional diesel engine has a particulate filter capable of capturing fine particles contained in the exhaust gas installed inside the exhaust gas passage in order to remove fine particles, such as soot, contained in the exhaust gas, and this particulate filter temporarily collects the fine particles contained in the exhaust gas. This particulate filter is recycled by removing the fine particles collected by the particulate filter by igniting and combusting them.

[0003] However, the abovementioned collected fine particles only become ignited when the temperature is high at 600 °C or higher. However, the exhaust gas temperature of the diesel engine is substantially lower than 600 °C, and the exhaust gas temperature is only between about 350 °C and 400 °C even during a high-load operation condition. Therefore, it is difficult to ignite the fine particles simply with the heat from the exhaust gas.

[0004] In light of this, there is a technique by which the fine particles are ignited by the heat of the exhaust gas only by lowering the ignition temperature of the fine particles by making the particulate filter to support a catalyst (the filter that is a particulate filter supporting a catalyst will be expressed as "particulate filter with catalyst" or simply "filter" hereafter). For example, the technique disclosed in Kokoku No. 7-106290 deals with the above issue by causing a catalyst that is a mixture of a platinum-group metal and an alkaline-earth metal oxide to be

supported by a particulate filter.

[0005] [Problems that the Invention is to Solve]

However, even the abovementioned particulate filter with catalyst sometimes leaves part of the fine particles remaining as a result of only a portion of the fine particles becoming ignited. Concretely speaking, there is no problem if the amount of fine particles contained in the exhaust gas is small, but a large amount of fine particles are generated in some cases depending on the operation condition of the internal combustion engine. In cases such as this, more fine particles become accumulated and form layers with the fine particles that are already attached to the particulate filter and failed to become combusted completely. This results in a phenomenon in which the fine particles making up the top layer that is likely to contact oxygen combust, while the fine particles making up the lower layer that is less likely to contact oxygen do not combust, leaving the fine particles that did not combust. Therefore, the accumulation of the fine particles clogs up the filter, which then becomes unusable since exhaust gas cannot pass through it.

[0006] Moreover, in the case of an internal combustion engine equipped with a turbocharger, the energy of the exhaust gas rotates the turbine. Therefore, the turbine cools down the exhaust gas and filter, making it likely for clogging to occur since the fine particles cannot be removed by being ignited and combusting. When the filter becomes clogged, it becomes difficult for the turbine of the

turbocharger to rotate, making it difficult for the compressor to carry out sufficient supercharging. As a result, high engine output cannot be achieved.

[0007] The present invention has been developed in light of the above points, and its aim is to supply an exhaust emission control device for an internal combustion engine in which a turbocharger and a particulate filter with catalyst are installed in its exhaust piped and which is capable of ensuring normal rotation of the turbine by resolving the clogging issue of the particulate filter with catalyst.

[0008] [Means for Solving the Problems]

To accomplish the abovementioned aim, an exhaust emission control device of the invention for an internal combustion engine employs the following means. In other words, an exhaust emission control device of the invention for an internal combustion engine is characterized by being equipped with: a turbocharger which is installed in the exhaust passage and which pressurizes the intake air by using the exhaust gas pressure; an inlet-side exhaust gas pressure detecting means that detects the exhaust gas pressure at the upstream side of the exhaust gas passage of this turbocharger; an outlet-side airflow amount detecting means that detects the amount of the airflow pressurized and taken in by the turbocharger; a filter that is installed in the exhaust passage, supports an oxidation catalyst, and can capture the fine particles contained in the exhaust gas; a bypass passage that branches off from the exhaust passage so that the

exhaust gas will bypass the filter and turbocharger; a bypass valve that opens and closes this bypass circuit; and a control means that controls the opening and closing of the bypass valve based on the value of the exhaust pressure detected by the inlet-side exhaust gas pressure detecting means and the amount of airflow detected by the outlet-side airflow amount detecting means. (Claim 1)

[0009] According to this structure, the control means judges the clogging condition of the filter based on the pressure-loss difference between the value of the exhaust gas pressure that flows into the turbocharger and rotates the turbine and the amount of airflow generated by the compressor directly linked with the turbine, and if the clogging is substantial, the control means opens the bypass valve to release part of the exhaust gas to the downstream side of the exhaust passage by making it bypass the turbocharger and filter. This reduces the amount of the exhaust gas flowing into the filter and increases the temperature inside the filter, which leads to the combustion of the fine particles and unclogging of the filter. Moreover, if the control means judges that the clogging has been resolved based on the pressure-loss difference, it closes the bypass valve and causes the turbocharger to perform its normal supercharging operation.

[0010] In the following, an ECU (control means) that controls the entire internal combustion engine will be described briefly, and the constituents of the present invention will also be explained. As

is commonly known, an ECU is made up of a digital computer, and is comprised of a central processing unit (CPU), read-only memory (ROM), random-access memory (RAM), backup RAM, input interface circuit, output interface circuit, etc., that are mutually connected by means of a bidirectional bus.

[0011] The input interface circuit is electrically connected to different types of sensors attached to the internal combustion engine and the vehicle, and when output signals from these sensors enter the ECU from the input interface circuit, these parameters become stored temporarily in the random-access memory (RAM). Subsequently, the CPU carries out necessary arithmetic processing based on these parameters, and for the execution of this arithmetic processing, the CPU calls out the parameters stored in the random-access memory (RAM) via the bidirectional bus as necessary. Moreover, the output interface circuit is electrically connected to various types of output apparatuses, such as the bypass valve, attached to the internal combustion engine and the vehicle, and commands from the ECU are output from the output interface circuit.

[0012] An example of the “inlet-side exhaust gas pressure detecting means” is a pressure sensor. An example of the “outlet-side airflow amount detecting means” is an airflow meter. In cases in which the internal combustion engines are diesel engines, examples of the “fine particles” are carbon soot, unburnt fuel, oil, etc. In cases in which the internal combustion engines are diesel engines, an

example of the “filter” is a so-called diesel particulate filter (DPF), which collects fine particles discharged from the diesel engine.

[0013] An example of the “bypass valve” is a waste gate valve (WGV). (Claim 4) A waste gate valve (WGV) is the exhaust gas bypass valve of the turbocharger, and normally prevents the supercharging pressure from exceeding the preset value. It regulates the turbine output by bypassing a portion of the exhaust gas flowing into the turbine to the turbine’s outlet, and thus controls the supercharged pressure. According to the invention, when the filter becomes clogged, the waste gate valve (WGV) reduces the amount of exhaust gas flowing into the filter by releasing a portion of the exhaust gas to the downstream side of the exhaust passage by making it bypass the turbine’s outlet and filter. As a result, the temperature inside the filter is increased, the fine particles are combusted, and the clogging is resolved.

[0014] In the exhaust emission control device of the present invention for an internal combustion engine, the abovementioned control means can instead be adapted to control the opening/closing of the bypass valve by evaluating the filter with respect to clogging based on the value of the exhaust gas pressure from the inlet-side exhaust gas pressure detecting means and the airflow amount from the outlet-side airflow amount detecting means. (Claim 2) This structure enables a clogging error of the filter to be detected based on the

value of the exhaust gas pressure and the airflow amount, simplifying the clogging error judging process carried out by the control means.

[0015] Furthermore, in the exhaust emission control device of the present invention for an internal combustion engine, the abovementioned control means can instead be adapted to cause the bypassing of the exhaust gas to occur by opening the bypass valve and to also generate an alarm if it judged that a clogging error of the abovementioned filter has occurred based on the abovementioned detected value of the exhaust gas pressure and the airflow amount. (Claim 3) According to this structure, the driver can be notified of the error by the alarm if a clogging error has occurred. This makes it possible for an artificial recycling operation to be carried out even if the clogging could not be resolved after a bypassing process was carried out by means of the bypass valve.

[0016] [Embodiment of the Invention]

In the following, an embodiment of the exhaust emission control device of the present invention for an internal combustion engine will be explained based on the accompanying drawings. Figure 1 illustrates a case in which the exhaust emission control device of the invention for an internal combustion engine has been applied to a diesel engine, which is a compression ignition internal combustion engine. With reference to Figure 1, reference numeral 1 denotes the engine's main unit, 2 denotes a cylinder block, 3 denotes a cylinder head, 4 denotes a piston, 5 denotes a combustion chamber, 6 denotes

an electrically controlled fuel injection valve, 7 denotes an intake valve, 8 denotes an intake port, 9 denotes an exhaust valve, and 10 denotes an exhaust port.

[0017] The intake port 8 is linked with a surge tank 12 via the corresponding intake branch pipe 11, and the surge tank 12 is linked with the compressor 15 of an exhaust turbocharger 14 via an intake duct 13. Moreover, an airflow meter (outlet-side airflow amount detecting means) 81 is attached to the intake duct 13, which is near the compressor 15, and the airflow amount of the outlet side of the compressor 15 becomes detected based on the output signal of the airflow meter 81. Meanwhile, the intake pipe 71 having the compressor 15 attached to it is provided with an air cleaner 80.

[0018] The intake duct 13 contains a throttle valve 17 that is driven by a step motor 16, and a cooling device 18 for cooling down the intake air flowing inside the intake duct 13 is arranged around the intake duct 13. According to the embodiment shown in Figure 1, the engine cooling water is led into the cooling device 18 and cools down the intake air.

[0019] Meanwhile, the exhaust port 10 is linked with the turbine 21 of the turbocharger 14 via the exhaust manifold 19 and exhaust pipe 20. Moreover, the exhaust pipe 20 near the turbine 21 has attached to it an exhaust gas pressure sensor (inlet-side exhaust gas pressure detecting means) 82, and the exhaust gas pressure of the inlet side of the turbine 21 is detected based on the output signal

from the exhaust gas pressure sensor 82. The outlet of the turbine 21 is linked with the exhaust emission control device A provided to the exhaust pipe 70, which is an exhaust passage. Moreover, the exhaust port 10 has attached to it a fuel-adding nozzle (not shown), which is a fuel supplying means. Therefore, the fuel-adding nozzle is located on the more upstream side of the exhaust pipe 70 than the exhaust emission control device A.

[0020] The exhaust emission control device A is obtained by building a catalyst-equipped particulate filter (filter henceforth) 22, which is a DPF supporting an oxidation catalyst and capable of capturing the fine particles contained in the exhaust gas, inside a case body 23. To remove the fine particles, such as soot, contained in the exhaust gas by using this exhaust emission control device A, the filter 22 collects the fine particles temporarily, and the collected fine particles are then ignited and burnt. To ignite and burn fine particles, it is possible to use the heat of the exhaust gas or the reaction heat generated by the oxidation reaction of the fuel supplied from the fuel-feeding nozzle to the exhaust gas. By burning and removing fine particles in this manner, fine particles are removed from the filter 22 to recycle the filter 22.

[0021] A bypass passage 90 that branches from the exhaust pipes, 20 and 70, is formed between the exhaust pipe 20 and exhaust pipe (exhaust passage) 70 in a manner such that the exhaust gas bypasses the turbine 21 of the turbocharger 14 and the exhaust emission

control device A (or filter 22). This bypass passage 90 is provided with a waste gate valve (WGV) 91, which is a bypass valve.

[0022] The WGV 91 is the exhaust gas bypass valve of the turbocharger 14. It normally prevents the supercharging pressure from exceeding the preset value, regulates the turbine output by causing a portion of the exhaust gas flowing into the turbine to bypass to the outlet of the turbine 21, and thus controls the supercharging pressure. In addition to the abovementioned controlling of the supercharging pressure, this WGV 91 of the invention opens the valve based on the filter clogging error evaluation, which will be described later, thus allows a portion of the exhaust gas to flow toward the downstream side of the exhaust pipe 70 via the bypass passage 90, and blocks the bypass passage 90 by closing the valve.

[0023] The exhaust manifold 19 and surge tank 12 are mutually linked via an EGR passage 24, which is a constituent member of an exhaust gas recycling device (EGR hereafter). Moreover, the EGR passage 24 has an electrically controlled EGR control valve 25. In addition, the EGR passage 24 has arranged in it a cooling device 26, which is for cooling the EGR gas that flows inside it. In the embodiment shown in Figure 1, the engine cooling water is led into the cooling device 26 and cools down the EGR gas.

[0024] Meanwhile, the fuel injection valve 6 is linked with a common rail 27, which is a fuel reservoir, via the fuel feeding pipe 6a. A fuel is fed into the common rail 27 by means of an electrically

controlled fuel pump 28 capable of varying its discharge amount. The fuel supplied to the common rail 27 is supplied to the fuel injection valve 6 via the fuel feeding pipe 6a. The common rail 27 has attached to it a fuel pressure sensor 29, which is for detecting the fuel pressure inside the common rail 27, and it controls the discharge amount of the fuel pump 28 based on the output signal from the fuel pressure sensor 29 so that the fuel pressure inside the common rail 27 will be the target fuel pressure.

[0025] Moreover, the amount of the fuel injected from the fuel injection valve 6 is calculated by obtaining the required torque that corresponds to the step-in amount of the accelerator pedal 40 and the number of engine rotations based on a required torque calculating map (not shown), which is stored in a map format inside the ROM 32 of the electronic control unit ("ECU" hereafter) 30 described below as the function between the step-in amount of the accelerator pedal 40 and the number of engine rotations.

[0026] The ECU 30 is composed of a digital computer, and is equipped with a ROM (read-only memory) 32, RAM (random-access memory) 33, CPU (microprocessor) 34, input port 35, and output port 36 which are mutually connected via the bidirectional bus 31.

[0027] The output signals from the fuel pressure sensor 29, airflow meter 81, and exhaust gas pressure sensor 82 are input to the input port 35 via the corresponding AD converters 37.

[0028] Moreover, an exhaust gas temperature sensor 79, which

detects the temperature, To, of the exhaust gas (output gas temperature), discharged from the exhaust emission control device A, is attached to the exhaust pipe 70 near the downstream side of the exhaust emission control device A. Moreover, an oxygen sensor (or air/fuel ratio sensor) 83 that detects the oxygen concentration of the exhaust gas discharged from the exhaust emission control device A (filter) is attached to a location of the exhaust gas temperature sensor 79 that is farther on the downstream side. Also, output signals from the temperature sensor 79 and oxygen sensor 83 are input to the input port 35 via the corresponding AD converter 37.

[0029] Furthermore, locations of the exhaust pipe 70 farther on the downstream side than the oxygen sensor 81 have attached to them an exhaust gas throttle valve and a catalyst converter (neither of them shown) that is a case body containing, for example, an $NO_X$ storage reduction catalyst.

[0030] The accelerator pedal 40 is connected to a load sensor 41, which generates output voltage that is proportionate to the step-in amount of the accelerator pedal 40, and the output voltage of the load sensor 41 enters the input port 35 via the corresponding AD converter 37. Furthermore, the input port 35 has connected to it a crank angle sensor that generates an output pulse each time a crank shaft (not shown) turns, for example, 30°.

[0031] The output port 36 is connected to the fuel injection valve 6, throttle-valve-driving step motor 16, EGR control valve 25,

fuel pump 28, and WGV 91 via the corresponding driving circuits 38.

[0032] With reference to the flowchart illustrated in Figure 2, the program for executing the filter clogging error judging process and avoidance control process, which are for judging whether or not the filter contained in the exhaust emission control device A of this embodiment is clogged up and for avoiding a clogged condition, will be explained. This program consists of step 101 - step 108 is described below. Moreover, the program consisting of these steps is stored in the ROM 32 of the ECU 30, and is called out as necessary. All of the processing carried out in each of the steps is executed by the CPU 34 of the ECU 30.

[0033] Moreover, the error judging map M shown in Figure 3 is utilized for this filter clogging error evaluation. This error judging map M is a map which was obtained by using the pressure loss difference and the airflow amount as parameters and which was obtained by defining in advance the relationship between the parameters and a filter clogging error based on experimental values. This pressure loss difference is the difference between the value of the exhaust pressure that turns the turbine 21 by flowing into the turbocharger 14 and the airflow amount produced by the compressor 15 directly connected to the turbine 21. However, the pressure loss difference can instead be the calculated difference between the abovementioned airflow amount and the target value of the exhaust gas pressure corresponding to the fuel injection amount determined by the

load sensor 41.

[0034] The ECU 30 calculates the pressure loss difference between the value of the exhaust gas pressure that rotates the turbine 21 by flowing into the turbocharger 14 and the amount of airflow generated by the compressor directly connected to the turbine 21 based on the airflow amount data obtained from the airflow meter 81 and the exhaust gas pressure data obtained from the exhaust gas pressure sensor 82, and then evaluates the filter for a clogging error by referring to the error judging map M.

[0035] In other words, this error judging map M is composed of a plane of coordinates wherein the vertical axis corresponds to the pressure loss difference and the horizontal axis corresponds to the amount of airflow generated by the compressor 15. This plane of coordinates is divided into three areas (mode $1E_1$, mode $2E_2$, and mode $3E_3$) by two dividing lines. The mode $1E_1$, in which the pressure loss difference is small, corresponds to the normal mode in which there is only little clogging, the mode $3E_3$, in which the pressure loss difference is large, corresponds to the mode that indicates a clogging error, and the mode $2E_2$, which is located between the mode $1E_1$ and mode $3E_3$, is a DPF recycling mode in which fine particles can be burnt and eliminated by carrying out a normal filter recycling process despite the slightly clogged condition it is in.

[0036] After the process is started, the ECU 30 reads the error judging map M out of the ROM 30 (step 101), monitors at all times the

amount of airflow by means of the airflow meter 81 and the exhaust gas pressure by means of the exhaust gas pressure sensor 82, and calculates the pressure loss difference based on the airflow amount data and exhaust gas pressure data (step 102).

[0037] Next, the ECU 30 evaluates the filter in terms of clogging based on the calculated pressure loss value and the detected airflow amount by referring to the error judging map M that has been read out (step 103).

[0038] If the evaluation carried out in step 103 reveals that the pressure loss value and airflow amount correspond to the area of the mode $1E_1$, the ECU 30 determines that [the mode] is the normal mode in which there is only little clogging (step 104) and returns to the start position.

[0039] If the evaluation carried out in step 103 reveals that the pressure loss value and airflow amount correspond to the area of the mode $2E_2$, the ECU 30 determines that [the mode] is the DPF recycling mode, burns and removes the fine particles by means of a normal filter recycling process (step 105), and returns [the process] to the starting point.

[0040] If the evaluation carried out in step 103 reveals that the pressure loss value and airflow amount correspond to the area of the mode $3E_3$, the ECU 30 determines that [the mode] is the error mode (step 106). Since the clogging condition is too advanced in the error mode for the filter 22 to be recycled by means of a normal filter

recycling process, the ECU 30 opens the WGV valve 91 (step 107), illuminates the diagram (alarm) indicating a clogging error of the filter 22 (step 108), and returns [the process] to the starting point.

[0041] When the WGV valve 91 is opened in step 107, a portion of the exhaust gas flows into the bypass circuit 90, which causes it to bypass the turbocharger 14 and filter 22. As a result, the amount of exhaust gas flowing into the filter 22 decreases, which increases the temperature inside the filter 22. This burns the fine particles and resolves the clogging.

[0042] Furthermore, the driver can be notified by the illumination of the diagram of the occurrence of a clogging error in the filter 22 in real time in step 108. Since repeated illumination of the diagram indicates that the bypassing process using the WGV 91 could not resolve the clogging, an artificial recycling operation, such as replacing the filter 22, becomes necessary. Since a filter clogging error can be dealt with at an early stage in this manner, it is possible to avoid risks of, for example, an engine stop occurring during driving and to prevent the exhaust emission control device itself from becoming damaged as a result of a filter clogging error being left unresolved.

[0043] [Effects of the Invention]

An exhaust emission control device of the present invention for an internal combustion engine can resolve clogging by: evaluating the

clogging condition of the filter based on the pressure loss difference between the value of the exhaust gas pressure that flows into the turbocharger to rotate the turbine and the amount of airflow generated by the compressor directly connected to the turbine; if the clogging is severe, [it can resolve clogging by] opening the bypass valve by means of the control means to release a portion of the exhaust gas toward the downstream side of the exhaust passage by making it bypass the turbocharger and filter, thus reducing the amount of exhaust gas flowing into the filter to increase the temperature inside the filter and thereby burning the fine particles. Therefore, the present invention can supply an exhaust emission control device for an internal combustion engine capable of ensuring normal rotation of the turbine by resolving clogging conditions of a catalyst-equipped particulate filter.

[Brief Description of the Drawings]

[Figure 1] A general drawing of an internal combustion engine to which an exhaust emission control device of the invention for an internal combustion engine has been applied.

[Figure 2] A flowchart illustrating the process for judging whether or not the filter contained in the exhaust emission control device pertaining to this embodiment is clogged and the process for averting a clogging situation.

[Figure 3] An explanatory drawing of the error judging map.

[Explanation of the Reference Numerals]

1 = engine’s main unit

2 = cylinder block

3 = cylinder head

4 = piston

5 = combustion chamber

6 = electrically controlled fuel injection valve

6a = fuel feeding pipe

7 = intake valve

8 = intake port

9 = exhaust valve

10 = exhaust port

11 = intake branch pipe

12 = surge tank

13 = intake duct

14 = exhaust turbocharger

15 = compressor

16 = step motor

17 = throttle valve

18 = cooling device

19 = exhaust manifold

20 = exhaust pipe

21 = turbine

22 = particulate filter with catalyst (filter)

23 = case body

24 = EGR passage

25 = electrically controlled EGR control valve

26 = cooling device

27 = common rail

28 = fuel pump

29 = fuel pressure sensor

30 = ECU (control means)

31 = bidirectional bus

32 = ROM

33 = RAM

34 = CPU

35 = input port

36 = output port

37 = AD converter

38 = driving circuit

40 = accelerator pedal

41 = load sensor

42 = crank angle sensor

70 = exhaust pipe (exhaust passage)

79 = exhaust temperature sensor

80 = air cleaner

81 = airflow meter (outlet-side airflow amount detecting means)

82 = exhaust gas pressure sensor (inlet-side exhaust gas pressure detecting means)

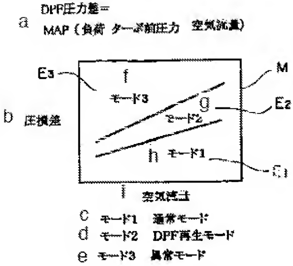
83 = oxygen sensor

90 = bypass passage

91 = WGV (bypass valve)

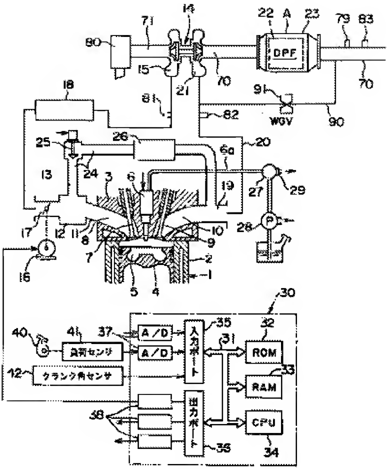
A = exhaust emission control device

[Figure 3]



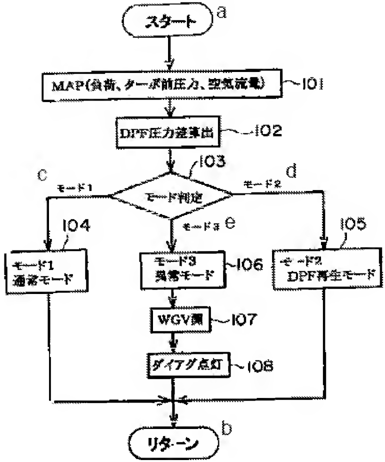

Key: a) DPF pressure difference = MAP (load, pre-turbo pressure, airflow amount); b) pressure loss difference; c) mode 1, normal mode; d) mode 2, DPF recycling mode; e) mode 3, error mode; f) mode 3; g) mode 2; h) mode 1; i) airflow amount.

[Figure 1] 




Key: 35) input port; 36) output port; 41) load sensor; 42) crank angle sensor.

[Figure 2]




Key: a) START; b) RETURN; c) MODE 1; d) MODE 2; 101) MAP (LOAD, PRE-TURBO PRESSURE, AIRFLOW AMOUNT); 102) CALCULATE DPF PRESSURE DIFFERENCE; 103) MODE EVALUATION; 104) MODE 1, NORMAL MODE; 105) MODE 2, DPF RECYCLING MODE; 106) MODE 3, ERROR MODE; 107) OPEN WGV; 108) ILLUMINATE DIAGRAM.